

REMARKS

The Official Action dated June 16, 2011 has been carefully considered. Additionally, the telephone interview of November 9, 2011 which the Examiner courteously afforded the undersigned is acknowledged and appreciated. Accordingly, the present response is believed sufficient to place this application in condition for allowance. Reconsideration is respectfully requested.

By the present Amendment, claim 1 is cancelled and claim 22 is added. Claim 22 includes limitations from claim 1, with positive recitation of the stress relief property and the drillability property of the extruded stock shape, as discussed during the aforementioned interview. Claim 22 also recites a lower limit dimension of "10 mm", as set forth in the specification at page 39, line 20, and that the extruded stock shape is produced by an extrusion and solidification method using an extrusion forming machine, to the tip of which an extrusion die and a forming die are coupled, wherein the forming die includes a cooling device at its exterior and is provided at its interior with a passage in communication with a passage of the extrusion die, as set forth in the specification at page 26, line 24-page 27, line 1. Claims 8-11, 14 and 15 are amended to change their dependency. It is believed these changes do not involve any introduction of new matter, whereby entry of the amendment is believed to be in order and is respectfully requested.

Interview

In the interview, the undersigned presented proposed amendments to recite the stress relief property and the drillability property of the extruded stock shape, along the lines of those now recited in claim 22, and the Examiner and the undersigned discussed the fact that both of these features are properties of the claimed extruded stock shape, and not merely process

limitations. The Examiner and the undersigned also discussed the differences in injection molding as compared with extrusion of stock shapes, and the differences in extrusion of films as compared with extrusion of stock shapes of the dimensions recited in the present claims. Although a formal agreement was not reached regarding the patentability of the present claims, the Examiner indicated that the claims as amended to recite the stress relief property and the drillability property of the extruded stock shape and arguments regarding the differences between the claimed extruded stock shape and the injection molded products exemplified by the cited prior art would be given further consideration.

Rejection Under 35 U.S.C. 103(a)

In the Official Action, claims 1, 8-11, 14 and 15 were finally rejected under 35 U.S.C. 103(a) as obvious and unpatentable over Nishihata et al, WO 00/34369. The Examiner asserted that Nishihata discloses a resin composition as claimed, which can be formed or molded into various shapes and applied in a variety of fields including machining. The Examiner further asserted that the shapes and sizes recited in the claims would have been obvious. With respect to the Applicants' previous arguments, the Examiner asserted that Nishihata discloses that poly(ether ether ketone) and poly(ether imide) can be combined, and that the extrusion and solidification, burr forming, and machining limitations are process limitations that do not further limit the claimed products.

These rejections are traversed and reconsideration is respectfully requested. As discussed during the interview, the extruded stock shape as claimed distinguishes over the general and specific teachings of Nishihata.

The extrude stock shapes as claimed are suitable, for example, for use in the fields of electric and electronic equipment parts, display equipment parts, and the like. One specific

application of the presently claimed extruded stock shape is as an IC socket used for inspection in a burn-in test in a semiconductor fabrication process wherein multiple contact probes are inserted into the body of the IC socket. Conventionally, an IC socket body is molded by injection molding which allows mass production. However, as noted at pages 5-6 of the present specification, resin parts used in electric and electronic fields are typically required to have high dimensional accuracy, and so the mold for injection molding must have high dimensional accuracy as well. In addition, since molded products often deform due to shrinkage and/or residual stress after the injection molding, the form of the mold for injection molding must be precisely controlled according to the shape of the molded product and properties of the resin material. Therefore, the mold for injection molding generally takes a long time to produce, and the production cost is expensive. Since the percentage of defective parts produced during injection molding is also high, the cost of injection molded products is often increased. Additionally, it is difficult to mold a product having a great thickness by injection molding and therefore there is a limit to the shape and size of parts produced according to injection molding.

On the other hand, it is known to extrude a resin material to produce a stock shape, such as a plate, round bar, pipe or special shape, and to subject such stock shapes to machining such as cutting, drilling or shearing to form a part of a predetermined shape. Advantageously, parts produced in small quantities can be economically produced compared with the injection molding process, the method can accommodate frequent changes in part specifications, parts high in dimensional accuracy are obtained, and parts having a shape or thickness unsuitable for the injection molding can be produced.

However, as set forth at pages 8-9 of the specification, the present inventors found that a formed product obtained by extrusion of a thermoplastic resin composition with conductive

carbon black exhibited unstable surface resistivity, deformation upon or after machining, and significant burr formation upon drilling. In order to form an IC socket body by machining of a polymeric stock shape, a great number of pin-inserting holes must be formed by drilling. When a burr is produced around an opening of each pin-inserting hole, deburring is required, significantly impairing operating efficiency of the machining process. If a formed product with a burr is used, i.e., the removal process is not employed, the pin-inserting operation is difficult and the electric and electronic equipment in which the IC socket is employed can be contaminated by subsequent separation of burr from the IC socket (see page 6, line 22-page 8, line 5 of the specification). Thus, injection molded parts, rather than extruded parts, have generally been used in the fields of electric and electronic equipment parts, display equipment parts, and the like.

However, the extruded stock shape for machining as defined by claim 22 overcomes disadvantages of injection molded parts and the described extruded parts. As defined by claim 22, the extruded stock shape is thick-walled in that it comprises an extruded plate having a thickness of 10 to 70 mm or an extruded round bar having a diameter of 10 to 70 mm, and has a combination of properties as recited in claim 22 that allow it to be relatively easily machined using cutting, shearing and/or drilling with precision to provide parts for use, for example, in electric and electronic equipment parts, display equipment parts and the like.

First, the extruded stock shape is produced by an extrusion and solidification method using an extrusion forming machine coupled with an extrusion die and a forming die which includes a cooling device and a passage in communication with a passage of the extrusion die. This device allows production of a thick walled extruded shape of the defined size in the solidified state. Second, the extruded stock shape has a surface resistivity of 10^5 to $10^{13} \Omega/\square$ and is formed of a defined combination of selected resins, carbon fiber and carbon precursor

providing good semiconductive properties and improved machining properties. Third, and importantly, the extruded stock shape is free of residual stress, wherein residual stress is stress which is relieved by heat treatment of the shape for at least 30 minutes at a temperature which is at least 150°C and at which the extruded shape is maintained in a solidified state after extrusion and solidification. The low residual stress in the extruded stock shape avoids undesirable deformation of the shape during and/or after manufacturing and machining. As noted, an extruded product high in residual stress upon extrusion tends to deform upon or after machining, and so it is difficult to obtain a machined product having high dimensional accuracy. Fourth, the extruded stock shape is drillable such that in a flat plate sample of the extruded shape having a thickness of 10 mm drilled with a drill diameter of 800 µm, at 8000 revolutions/min and a feed speed of 200 mm/min, a burr around a drilled hole has a length of not longer than 30 µm as observed with an electron microscope. This means that burr removal is avoided and machining is facilitated using the extruded stock shape as claimed.

As discussed with the Examiner during the interview, Nishihata discloses at page 29, lines 3-5, that the resin mixture may be formed into pellets for molding or forming, and at page 29, lines 14-19, that the resin compositions can be formed into formed or molded products of various shapes, for example, sheets, films, tubes, container, etc. by conventional melt processing techniques such as injection molding and extrusion. As described at page 38, lines 10-19, the Examples and Comparative Examples of Nishihata prepared pellets by extrusion and the pellets were then injection molded to form flat plates having a thickness of 3 mm. No other reference to extrusion of a resin composition is found throughout the teachings of Nishihata.

Thus, Applicants find no teaching or suggestion by Nishihata of an extruded stock shape which comprises an extruded plate having a thickness of 10 to 70 mm or an extruded round bar

having a diameter of 10 to 70 mm. As noted above and in the present specification, such thick walled shapes are not typically formed using the injection molding techniques exemplified by Nishihata. Further, Nishihata's brief reference to extrusion suggests conventional melt extrusion and provides no teaching of extruded shapes of the size claimed, free of residual stress and having a drillability property that minimizes burr formation, or how one of ordinary skill in the art would obtain such an extruded stock shape free of residual stress and drillable as claimed.

Additionally, the resin composition of claim 22 is carefully controlled to contribute to the desired properties of the extruded stock shape. The thermoplastic resin recited in claim 22, which is a mixture composed of a combination of poly(ether ether ketone)/poly(ether imide), poly(ether imide)/poly(phenylene sulfide), poly(ether ether ketone)/poly(phenylene sulfide), or poly(ether ether ketone)/poly(ether imide)/poly(phenylene sulfide), is a heat-resistant resin, whereby deformation or discoloration of the extruded stock shape by frictional heat is minimized when the resulting extruded product is subjected to machining such as cutting or drilling (see the specification, for example, at page 13, line 27-page 14, line 4). At least two of the resins are used in combination to inhibit the production of burrs in the extruded stock shape upon drilling as the use of a single resin having high toughness tends to produce burrs upon drilling but the combined use of a resin having high toughness and a resin having relatively low toughness markedly inhibits the production of burrs (see the specification, for example, at page 15, lines 13-22). Nishihata provides no teaching or suggestion in this regard and, instead, notes that no particular limitation is imposed on the synthetic resin useful in the practice of the invention (page 14, lines 3-4).

The inclusion of the carbon fiber also contributes to inhibit the burr formation upon drilling (see the specification, for example, at page 19, lines 22-24).

Additionally, the carbon content of the carbon precursor is 80-97% by mass. If the carbon content in the carbon precursor is too low, the volume resistivity of such a carbon precursor become too high, and it is hence difficult to control the surface resistivity of the resulting extruded stock shape for machining to $10^{13} \Omega/\square$ or lower (see the specification, for example, at page 18, lines 12-16).

Further, 30 to 94% by mass of the thermoplastic resin, 5 to 40% by mass of the carbon precursor, and 1 to 30% by mass of the conductive carbon fiber are employed. If the proportion of the thermoplastic resin is too high, the surface resistivity of the extruded stock shape becomes too high, and it is difficult to provide an extruded stock shape having a desired surface resistivity within the semiconductive region. If the proportion of the thermoplastic resin incorporated is too low, the volume resistivity of the extruded stock shape becomes too low, and it is difficult to provide an extruded stock shape having a desired surface resistivity within the semiconductive region (see the specification, for example, at page 23, lines 18 to page 24, line 1). If the proportion of the carbon precursor is too high, the mechanical properties of the extruded stock shape are deteriorated, and machining can be adversely affected. If the proportion of the carbon precursor is too low, it is difficult to sufficiently lower the surface resistivities of the extruded stock shape for machining or to strictly control the surface resistivity within the range of 10^5 to $10^{13} \Omega/\square$ (see the specification, for example, at page 24, line 22-page 25, line 4). Finally, if the proportion of the conductive filler is too high, the surface resistivities of the extruded stock shape become too low, or it is difficult to precisely control the surface resistivities to the desired values within the semiconductive region. If the proportion of the conductive filler is too low, it is difficult to sufficiently lower the surface resistivities of the extruded stock shape or to control the

surface resistivities to the desired values within the semiconductive region (see the specification, for example, at page 25, lines 8-18).

In determining patentability under 35 U.S.C. §103, it is necessary to determine whether there was an apparent reason to combine known elements in the fashion of the claims at issue, *KSR International Co. v. Teleflex, Inc.*, 550 US 398, 418 (2007). The evidence of record provides no apparent reason for one of ordinary skill in the art to modify Nishihata along the lines necessary to result in the extruded stock shape of the present invention, particularly since Nishihata is mainly concerned with injection molded products and provides no teaching or suggestion as to an extruded stock shape of the size recited in claim 22, or having the low residual stress, composition and drillability as recited in claim 22. Thus, Nishihata does not render the presently claimed extruded stock shapes obvious under 35 U.S.C. 103.

Accordingly, the rejection under 35 U.S.C. 103(a) has been overcome. Reconsideration is respectfully requested.

It is believed that the above represents a complete response to the Official Action and reconsideration and an early allowance is requested. The Examiner is encouraged to telephone the undersigned in the event that there are any outstanding issues in the application. Please charge any fees required in connection with the present communication, or credit any overpayment, to Deposit Account No. 503915.

Respectfully submitted,

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